FRAME INTEGRATED REAR SUSPENSION

Background Art

1. Field of the Invention

[0001] The invention relates generally to wheel suspension systems for motor vehicles. More particularly, the invention relates to a rear wheel independent suspension system.

2. Description of Related Art

[0002] Suspension systems of a vehicle connect the axle shafts with the vehicle body. The suspension system controls a position of a tire with respect to the vehicle body. In addition, the suspension system prevents the axle shaft from directly transmitting vibrations or impacts from a road surface to the vehicle body; thereby, providing a smoother ride. Typically, suspension systems are made to be flexible to absorb the impact from a driving surface and limit the forces transmitted from the tires to the vehicle body.

[0003] Suspension systems are generally classified according to their performance characteristics and structures. For example, many vehicles are manufactured with independent rear suspensions wherein each rear wheel is able to react to the conditions of driving without transmitting its motion and forces to the vehicle body or other rear wheel. This independent suspension improves the handling and driving characteristics of the vehicle.

[0004] Typically, independent suspensions are designed such that they exhibit dynamic handling responses during understeering conditions. A preferred suspension design would exhibit minor changes of wheel position when driven in a straight line, as well as exhibit a high transverse reaction force during cornering. Such suspension characteristics are typically achieved by a suspension having a high roll center, as well as the ability to provide for changes in camber angle to compensate for body roll during a cornering maneuver. Further, lateral forces produced during a cornering maneuver should typically generate a toe-in behavior equaling the body roll understeering during the cornering maneuver.

[0005] As well as the performance characteristics outlined above, it is desirable to have a suspension system having a reduced number of parts thereby lowering the overall cost of a suspension system for a motor vehicle. There is, therefore, a need in the art for a suspension system providing a significant toe-in through lateral forces, as well as a high roll center and a reduced number of parts compared to typical suspension systems; thereby, lowering the overall cost of a suspension system.

Summary Of The Invention

[0006] An integrated rear suspension assembly is fixedly secured to a transmission case, rear wheel carriers, and frame rails of a motor vehicle. The integrated rear suspension assembly includes a plurality of trailing arms having first and second ends. Each of the first ends is secured to one of the frame rails and each of the second ends is secured to each of the rear wheel carriers. A a plurality of control arms is pivotally secured to each of the plurality of trailing arms for controlling the plurality of trailing arms. A compound link member having opposing ends is attached to each of the plurality of trailing arms. The integrated rear suspension assembly also includes a transmission cross member that is fixedly secured to each of the frame rails. The transmission cross member includes fixtures that receive and secure the transmission case and each of the plurality of control arms thereto such that the transmission cross member facilitates the integrated rear suspension assembly and the transmission case to be assembled prior to securing said integrated suspension assembly to the frame rails.

Brief Description Of The Drawings

[0007] Additional features and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0008] Figure 1 is a top, front perspective view of the suspension system of the invention;

[0009] Figure 2 is a rear, bottom perspective view of the suspension system of the invention;

[0010] Figure 3 is a perspective view detailing the suspension system without the wheels and frame rail; and

[0011] Figure 4 is a partial top view detailing the attachment of the trailing arm, upper control arm and compound link with the frame rail.

Detailed Description Of The Preferred Embodiments

[0012] Referring to Figure 1, a rear wheel suspension system, generally indicated at 5, including a pair of spaced frame rails 10, a pair of trailing arms 15, and a transmission cross member 20 is shown. A pair of upper control arms 25 are connected at one end 26 to the transmission cross member 20 and at a second end 27 to the trailing arms 15. A compound link member 30 is attached to the pair of trailing arms 15 at opposing ends 31, 32 of the compound link member 30. The compound link member 30 includes a bell crank 35 associated therewith. A watts linkage 40 including opposing connecting rods 41, 42 attached at one end 43 to the frame rail 10 and at the other ends 44 to the bell crank 35 is also included. A rear cross member 47 is fixedly secured to the frame rails 10. The rear cross member 47 has a low profile that results in a lowered load floor (not shown).

[0013] As seen in Figure 2, the pair of spaced frame rails 10 are connected to each other by various cross members distributed along a length of the frame rails 10 Specifically, the transmission cross member 20 provides support to the transmission casing 21, as well as provides structural rigidity to a chassis of a vehicle formed by the frame rails 10. The transmission cross member 20 includes fixtures, shown as bolts 23 in Figure 1, to secure the transmission case 21 thereto. The transmission cross member 20 includes fixtures to secure the control arms 25 thereto. The transmission cross member 20 is preferably coupled to the frame rails 10 using brackets 22 attached to the frame rails 10, as best seen in Figure 1.

[0014] The pair of trailing arms 15 includes inner 16 and outer 17 components. The inner component 16 is nested within the outer component 17. Each of the inner 16 and outer 17 components extend the length of the trailing arms 15.

Each of the trailing arms 15 is attached to each of the spaced frame rails 10. A first end 18 of the trailing arm 15 is secured to the trailing arms 15 with a bracket 9. A second end is attached to a wheel carrier 45.

[0015] As best seen in Figures 2 and 3, half shafts 50 from the transmission casing 21 are coupled to the wheel carriers 45 through an opening 8 formed in the trailing arms 15. The half shafts 50 provide rotational motion to the wheel carriers 45 from a shaft (not shown) engaging the transmission casing 21.

[0016] Referring to Figure 3, the pair of upper control arms 25 are attached to the transmission cross member 20 (as best seen in Figure 1) at a first end 26 of the control arm 25, and to the trailing arms 15 at the second end 27 of the upper control arm 25. The upper control arms 25 provide structural strength to the suspension system 5, as well as provide control and relieve stresses associated with the trailing arm 15 attached to the wheel carrier 45.

[0017] Again, referring to Figure 3, the compound link member 30 is positioned between the opposing trailing arms 15 and is attached at a lower portion 55 of the trailing arm 25 by an appropriate bracket 60. The compound link member 30 includes a bell crank 35 associated therewith approximately at the center of the compound link member 30 between the pair of trailing arms 15. A watts linkage 40 including opposing connecting rods 41, 42 are attached at one end 43 to the frame rails 10 and at the other end 44 to the bell crank 35 with the use of appropriate bushings. As best seen in Figure 2, the connecting rods 41, 42 are connected on their first end 43 to the frame rail 10 by an appropriate bracket 70 attached to the frame rail 10. The bell crank portion 35 of the watts linkage 40 provides crosswise or lateral support for the suspension as the connecting rods 41, 42 or links are positioned in a transverse direction with reference to the driving direction. The watts linkage 40 transmits the lateral forces necessary to achieve the desirable toe-in and lateral force transfer characteristics outlined in the background section of the application.

[0018] In a preferred aspect of the invention, the suspension system 5 further includes a pair of coil over shocks 75 as best seen in Figures 2 and 3, attached to the compound link member 30 via appropriate brackets 80. The coil over shocks 75 are

attached at their other end to the spaced frame rails 10 to provide for motion of the trailing arms 15 and compound link member 30 relative to the frame rails 10.

[0019] The invention has been described in an illustrative manner. It is to be understood that the terminology, which has been used, is intended to be in the nature of words of description rather than of limitation. Many modifications and variations of the invention are possible in light of the above teachings. Therefore, within the scope of the appended claims, the invention may be practiced other than as specifically described.